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MAKING THE MOST OF FARM PRODUCTS

Talk by Dr. Byron T. Shaw, Administrator, Agricultural Research Service, U. S. Department of Agriculture, before the National Association of State Departments of Agriculture, Winston Salem, N. C., September 24, 1963

I am very glad to have the opportunity of meeting with you here today at your National meeting. We in the United States Department of Agriculture --- and specifically in the Agricultural Research Service---share many interests and efforts with you. As you spend your time and endeavors to support the welfare of agriculture in your State, we join with you in interstate and national cooperation.

We are all thoroughly familiar with our joint efforts in conducting regulatory programs. Some of these programs combat the diseases and pests that undermine the economic security of agriculture by adding \$10 billion to the annual cost of the Nation's farm production. We must and we will continue our efforts to reduce that cost.

Yesterday Dr. Robert Anderson discussed our joint efforts to promote the safe and effective use of pesticides. And there are many other ways in which we cooperate, in full understanding and agreement, to protect both agriculture and consumers.

But perhaps there are some areas of our research programs about which we have had few opportunities to communicate with you directly. As a result, you may not have a full and complete understanding of our current status and objectives for the future.

I would like to discuss one of those areas today . . . and that is our utilization research program, through which we help agriculture make the most of farm products.

Utilization research concerns farmers, processors, and consumers in every State in the Union . . . and therefore, it concerns you as representatives of your State Departments of Agriculture. You have the responsibility to understand where we are today in research on the utilization of farm products, and where we hope to be going.

A great deal of general interest has been expressed in utilization research during the last few years. These expressions have ranged widely among many different points of view. Some have advanced the idea that through utilization research---to find new and wider uses for farm products---we could solve most of our agricultural problems, especially the problem of surplus farm commodities. This idea is usually coupled with the belief that most of our other agricultural research should be discontinued and all our emphasis put upon utilization. To carry this one step further, some people have the opinion that the best way to put this emphasis on utilization research is to set up a separate agency to administer it. Bills have been introduced into the Congress to this effect.

On the opposite end of the scale, others believe that utilization research, as we know it today, has not been effective during these first twenty-five years of its history. Therefore, we should either de-emphasize it or discontinue it entirely. Various other opinions fall somewhere in between these two extremes.

The United States Congress has also expressed a continuing interest in this field of agricultural research. An additional \$5 million was appropriated for fiscal year 1963 for the purpose of expanding utilization research. That amount represented a compromise between the recommendations of the House and Senate.

At the same time, the Senate asked ARS to submit a plan for expanding utilization research, if an additional \$35 million were provided---raising the total appropriation to \$59 million a year. We have submitted our plan to the Senate, and it has just been released as Senate Document 34, 88th Congress, First Session.

The Committee on Appropriations of the Senate has reported our Appropriations Bill for 1964 to the Senate, which provides funds to implement this program. The Senate has not acted on the Bill---and, of course, following Senate action, there will have to be a reconciliation between the Senate and House Bills. So we don't know what the final outcome may be.

For all these reasons, it is understandable that there may be some confusion about the facts of the matter, and about our policy in the Agricultural Research Service concerning utilization research. So let us look at the facts as we see them.

In the first place, we know that we cannot solve all agricultural problems through utilization research. It is not a panacea. We cannot even solve the surplus commodity problem through this approach alone. Many people over the years have suggested such ideas as converting surplus grain into industrial alcohol for use in motor fuel. It sounds like an excellent idea. The only single outlet in our economy large enough to absorb our supply of surplus grain is that of motor fuels. Grain can be converted into industrial alcohol. But the cost of conversion and the lack of advantages that alcohol can make to present day gasolines are such that the end product could never compete successfully with petroleum products.

We tried another idea that was frequently suggested---making a synthetic rubber product from surplus farm commodities. That, too, proved too costly to be practical. Such ideas as these for the large industrial outlets must be weighed against the practical economics of competition. Our most profitable approach toward wider markets is not through competition with other products, better suited for their purpose. Our best approach is through finding out more about the natural characteristics of the various farm products, and making the best use of them by new and improved methods of processing.

Studies aimed in this direction are making a significant contribution to finding wider markets for surplus farm products. So, if utilization research is not the panacea for our ills, it is an important part of the cure. We believe that with certain expansions, the contribution can be even greater.

We believe that utilization research is a vital and integral part of agricultural research. It helps to support---and in turn---is supported by the other scientific approaches to agricultural and related consumer problems. The one field of research could not operate as effectively if it were separate and apart from the other closely allied facets of a total agricultural research program. And a total research program is necessary to provide the knowledge we must have to solve the increasing complexities of agriculture in a competitive economy. We have many unsolved problems today---and we can expect many more in the years ahead as a smaller and smaller percentage of our people must produce the food and fiber for a rapidly expanding population.

Utilization research is making widely varied contributions to our economy. In its twenty-five years of operation, USDA Utilization Research and Development has added over \$2.5 billion to the value of farm commodities, at a research cost of less than \$175 million . . . a relationship of nearly 15 to one. Each year, the return has increased, as more results of the research are put to work. During the past five years, for example, the relationship of benefits-to-cost has increased to 25 to 1. This means more money in the pockets of farmers.

In addition to the contribution toward increasing farm income, these research results have helped to establish rural industries as new processing methods are put into effect. For example, our development of a satisfactory frozen orange juice concentrate---in cooperation with the Florida Citrus Commission---has led to new and expanded local industries, as well as enlarged market outlets for citrus growers.

USDA utilization research played a key role in creating a place for soybeans in American agriculture. The development of a processing technology has made the soybean a major source of vegetable oil for edible and industrial purposes---and of high protein meal for the nation's livestock and poultry industries.

Cotton was about to be swamped in the market by mounting waves of synthetic fibers until utilization research developed wash-and-wear cottons. Now more than one million bales of American cotton are made up into these products every year. We have just recently developed all-cotton stretch fabrics that may very well prove to be just as much of a boost to cotton markets as the wash-and-wear fabrics. They should compete successfully with other fabrics for clothing, slip covers, and other markets where the texture and stretch quality of cotton are most desirable.



Another area in which new outlets were needed is that of animal fats, displaced from traditional soap markets by synthetic detergents. Utilization research has developed outlets for about 500 million pounds of these fats a year, just in processed feeds alone. Cooperative research with industry and others, starting in the early 1950's, showed that all grades of animal fats and tallow could be used in feeds. The fats not only have nutritional value, but also reduce dustiness and improve color of the feeds. Already, this new outlet is off-setting the declining market for animal fats. Other outlets have been developed in water-base paints, plastics, waxes, adhesives, and other industrial products.

In 1941, USDA Utilization Research cooperated in a program with the Armed Forces, pharmaceutical manufacturers, and British scientists to develop large scale production methods for making pencillin. As a result of this work, the cost of producing pencillin was reduced from \$1400 to about \$100 a pound, during the ten-year period from 1947-1957. A part of our research contribution to this accomplishment is covered by eight patents. The value of providing large-scale, low-cost production of penicillin would be difficult to assess, in terms of human health and improved feeds for livestock.

We have given considerable attention to finding wider markets for grains. For example, utilization research has demonstrated the usefulness of dialdehyde corn starch in leather tanning and as an agent for producing wet-strength paper. Other promising outlets include adhesives and binders, film hardeners, and textile processing aids.

An economical process has been developed for treating wheat flour with chemicals to produce properties needed for applications as adhesives and as sizing and coating materials for paper and textile products. We are now conducting studies on a number of other industrial uses for this chemically-treated flour.

We've made extensive studies on the storage and handling of frozen foods. The results of this research demonstrated ways to improve the maintenance of the original high quality of the products, and industry has accepted these findings as standards for the handling of frozen foods.

These are just a few examples of the outstanding contributions utilization research has been making to agriculture, to consumers, and to the national economy. But let us look for a moment at where we stand now, and where we may be going in the future.

A few months ago, we combined our Nutrition and Consumer Use Research with Utilization Research under one unit, called Nutrition, Consumer, and Industrial Use Research.

Under this new arrangement, we have a better coordinated program. All the work done in utilization research on new food products has nutritional implications. We now have an opportunity for better joint planning and conduct of this research. The same thing is true of work on cotton and wool as related to clothing. Also, now that we have our research on consumer and food economics in this combined activity, we have greater assurance that consumers' needs and desires get proper attention in our utilization research.

More of our total resources are now focused on consumer needs by having better coordinated and more cooperative programs. Overhead expenses are reduced and more of the combined resources can go into research.

This new realignment will not slow up our utilization research. For example, this year we are trying out a new process for making "instant" grapefruit powders of excellent quality by foam-mat drying. Grapefruit juice powder with remarkably fresh flavor has been produced in 100 pound lots . . . and now, in cooperation with the Florida Citrus Commission, we are producing on a pilot-plant scale lots to be evaluated in European and other markets.

Another approach to utilization research is to improve the quality of existing products in order to maintain and increase consumer acceptance. For example, a Department scientist discovered a process to increase the shelf life and improve the quality of evaporated milk. The new process makes it possible to manufacture a product with less cooked flavor and better storage stability than conventional evaporated milk. Producers are now testing the commercial practicality of this discovery.

On another front, Department research on the stabilization of important nutrients of dehydrated alfalfa is playing a vital role in the development of a new export market for this product. Without the use of this new process, it would be impossible for the United States to deliver high quality dehydrated alfalfa to Europe or Japan because of the prolonged transportation time and resulting loss of nutrients. Since the new process was accepted in 1958, exports of dehydrated alfalfa have risen from virtually none, to 150,000 tons last year. This figure is expected to increase in the future.

We have also been conducting utilization research on the new crop, crambe, now under development in another area of our Department's research program. These studies on processing crambe seed to oil and meal have revealed significant new information on biologically important components of the meal. They have provided the basis for new techniques for producing feed meal with acceptable nutritional qualities. Crambe, a plant related to rape and mustard, has excellent crop potential and gives satisfactory yields under dry-farming and irrigation conditions. It can be grown in place of crops now in over-abundant supply, and provides an entirely new oil whose composition lends itself to industrial use.

Now, as we look to the future of utilization research we can see some general directions and some specific plans that should be followed.

In the first place, we should continue and expand our basic research in this field. As we gain more detailed knowledge about plant and animal tissues, we will be in a better position to find new uses for them, improve their quality, and develop better methods of processing them.

As indicated in Senate Document 34, if additional funds are made available to us, we would want to add to our current buildings and thus increase our in-house capacity. We also would want to increase our utilization research under grants and contracts. We finance these grants and contracts with appropriated funds, but they are conducted with the facilities and the personnel of other research organizations. Research conducted under a grant normally comes to ARS in the form of a proposal from another research organization . . . a proposal of research they would like to conduct, but lack the necessary funds. Last year was the first time we made any grants, but we expect that as our funds increase we will use this device more and more frequently in the area of basic research.

Research conducted under contract normally originates with ARS in the form of a project, specifically outlined, to provide knowledge that we need and want. We then approach a qualified research organization and ask them to conduct the research under contract.

For example, we have recently contracted for research on the bacteria that cause milky disease of Japanese beetles, to be conducted by Kansas State, Michigan State, Illinois, and Minnesota Universities.

These contract studies are phases of a comprehensive search by the Agricultural Research Service for a way to mass-produce milky disease spores as a biological weapon against the Japanese beetle.

The four contract studies will be coordinated by the Northern Utilization Laboratory at Peoria, Illinois, whose studies, now in their fourth year, show that large populations of milky disease bacterial cells can be grown successfully with corn sugar and other nutrients by industrial fermentation. The contract researches are aimed at developing the information needed for the next step----inducing artificially grown cells to develop spores. These spores that survive in the soil cause milky disease when ingested by the Japanese beetle grubs. If we can develop this method successfully, it could provide a very valuable tool in our eradication efforts against this pest.

As funds permit we intend to increase the grants and contracts in utilization research on a sizeable basis. We also plan under memoranda of understanding to provide larger amounts of funds in projects located at a single university, rather than scattering small portions of the work among several locations.



Much of the cooperative work may be outside of the schools of agriculture . . . with departments of chemistry and engineering, for example. We are in the process of activating programs of this type with North Carolina State, California Institute of Technology, and the Universities of North Dakota and Minnesota. We are having exploratory communications with other universities.

These results can probably be most helpful in alleviating the surplus problem in four major areas. These are in the fields of industrial chemicals, textiles and fibers, improved food products, and feeds.

Looking at these areas one at a time . . . the organic chemical industry annually turns out some 15 billion pounds of plastics, detergents, plasticizers, and a great variety of solvents and other useful products. These fields are growing at rates as high as 10 percent or more per year.

Most of these synthetics are based on petroleum or coal. These are available at low and stable prices . . . supply and quality are constant. and above all, they have properties which adapt them to processing to the desired end-product by economical means. Therefore, there is little opportunity for agricultural commodities to displace them in present uses.

In other applications, however, the specific characteristics of farm products make them especially suited for manufactured end-products at lower costs than the competing fossil raw materials. Epoxy plasticizers prepared from agricultural fats and oils are prime examples. They are now accounting for forty million or more pounds per year, and their use in vinyl plastics is expanding rapidly. The vinyl esters of fatty acids are another example of commercial importance.

I have mentioned the "cereal-pulp" products, made from chemically converted wheat flour or cereal starches. If our early findings are borne out by larger scale tests, this development has an excellent possibility for improving a variety of paper products. . . . newsprint, coating adhesives, coarse paper, and building and insulating boards. Such outlets could absorb as much as 100 to 180 million bushels of grain.

In textiles and fibers the improvements of cotton and wool already made through research have demonstrated that their markets can be maintained. We are working now on better methods of processing both fabrics to provide more satisfactory and longer-lasting wash-and-wear qualities. Our scientists are conducting searching studies into the basic structure of both the cotton and wool fibers . . . they hope to develop specific knowledge about how to provide more of the qualities desired by both processors and consumers.

We have made great strides in improving food products in recent years. Over the past half century our food habits have undergone continuous adjustment to our new way of living. Today's housewife, with her widely varied fields of interest, no longer has time or the inclination to pluck chickens, peel potatoes, or squeeze oranges.

There is still an important potential for the development of more convenience foods -- animal products, for example. Utilization research can make important contributions to bringing about increased consumption of animal products through the development of new and attractive foods, excellent in quality, convenient in preparation for the table, and at prices which will encourage consumption.

There are still developments to be made in improving animal feeds through utilization research. The progress we have made so far assures us that we can make still more. For example, high quality cottonseed meal for feeding poultry opened up a new market of as much as 400,000 tons. This development resulted from a cooperative research effort by the U. S. Department of Agriculture, State Experiment Stations and industry in producing cottonseed meals of lower gossypol content and higher nutritional value.

And so, in short, utilization research is making an important contribution to the national well-being. We believe that this contribution can be increased and expanded in the years ahead, particularly with the cooperation of the State colleges and universities, as well as related industries. Even though we do not promise any miracles that will suddenly make all the surpluses disappear, we can and will do an even better job of making the most of farm products.

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